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Phone (970) 387-5533 • Fax (970) 387-5310

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OFFICE

Received

FEB 20 2003

Durango Field Office  
Division of Minerals & Geology

Wally Erickson, Reclamation Specialist  
Department of Natural Resources  
Division of Minerals and Geology ✓  
Durango Field Office  
701 Camino del Rio, Room 125  
Durango, CO 81301

RE: File No. M-77-378, TR-25  
American Tunnel Bulkhead No.3  
Construction Certification Report

Dear Mr. Erickson:

This letter report is to provide certification that construction of the American Tunnel near-surface bulkhead meets or exceeds design criteria. Submittal of a construction certification report was committed to by SGC in TR-25 and required as a Stipulation for TR approval.

Pre-pour inspections were conducted by DMG on November 8, 2002 and the design engineer, John F. Abel, Jr. P.E. on November 11, 2002. A letter report from the design engineer, John F. Abel, Jr. P.E. is attached. No deficiencies were found in either pre-pour inspection although there are some variances from the original design explained further below.

#### Bulkhead location

The approximate center of the bulkhead, approximately four feet above the sill, on the air-side face (side towards surface) of the bulkhead is a point with coordinates of 11,390.51 N, 12,186.11 E at an elevation of 10,594.7 feet. These coordinates are based on a coordinate system with USLM Moultrie being at coordinates 11,964.00 N, 20,000.00 E at an elevation of 12,728.73 feet.

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American Tunnel Bulkhead No.3  
Construction Certification Report  
Page 2

The construction stages for certification are listed below.

**Bulkhead Buffer - Lime Placement**

Two tons of hydrated lime were placed at the downstream face of Bulkhead No.2 and two tons were placed between the cofferdam and upstream face of Bulkhead No.3. In addition, an additional two tons were placed at the downstream face of Bulkhead No.3.

**Bulkhead location preparation (scaling and washing)**

The bulkhead site was scaled clean of loose material and sandblasted to remove any surface coating that may have been present. It was then washed down and vacuumed clean of water, sand and rock residue. This stage of site preparation was adequate to maximize the potential for bonding between the rock and the concrete and was also inspected by the design engineer, John F. Abel, Jr., and DMG during their respective pre-pour inspections.

The final excavation was within the dimensions used for design, 12' wide x 15'high.

**By-pass or diversion pipe**

The diversion pipe through the bulkhead is a 6" Schedule 40 - stainless steel pipe fitted with one thrust collar (3/8" thick – 2" larger in diameter than the pipe) and two light gauge seep collars. The thrust collar was placed at a distance of greater than 5' from the downstream face to allow any loads to be distributed to the tunnel walls. Two seep collars were placed downstream of the thrust collar, to minimize the ability of impounded water to travel along the outside of the pipe. Bars were welded inside the pipe (upstream side) to provide a stop for the grout pig to simplify grouting the pipe full upon completion of the bulkhead. The pipe entrance was extended upstream to a temporary cofferdam, placed to keep the bulkhead area dry during construction. The pipe system was adequate to keep the area dry until after the concrete had sufficient time to cure. The original TR submittal anticipated that a 4" Schedule 40 – stainless steel pipe would be adequate to transport the flow through the bulkhead area during construction but because the flow was larger than anticipated at the time of submittal, the size was increased to 6" in order to assure adequate capacity for the flow during construction without increasing the depth of the cofferdam. This change would have no material effect on the constructed bulkhead.

#### Construction of concrete forms and erection of rebar cages

The forms were constructed of vertical 8"x8" S4S posts and horizontal 2"x12" and 2"x6" S4S lagging. The form interior was lined with  $\frac{3}{4}$ " plywood for additional strength. Bracing consisted of angle iron and pipe anchored to the ribs, sill and back of the drift.

The form construction and bracing was adequate to prevent movement or failure during filling of the forms.

The rebar cages were supported by dowels (rebar) grouted into the rib. The upstream rebar cage is #6 bars on a 12"x12" grid and the downstream rebar cage is #10 bars on a 6"x6" grid. The minimum clear distance from the form to the rebar is 3.5". The minimum bulkhead length was specified to be 11' and the actual length was 11'2". Trim bars (5' long) were placed at 45<sup>o</sup> to the rebar around the cutouts in the rebar cage for the pipe. All minimum clearances, dimensions and spacings met design criteria and were inspected by the design engineer prior to filling of the forms. The design report had contradictory downstream rebar spacings between the text and calculations. The bulkhead was constructed with the more conservative spacing (ie closer spacing) which provides more strength than required by the calculations.

#### Perimeter area irregularity

The rock contact perimeter area irregularity required to develop the design compressive strength of the concrete when subject to the maximum design thrust was determined to be 8.8% of the area with a projection of 0.14" or more.

Quantification of a minimum perimeter area irregularity was accomplished by measuring x-sections within the bulkhead length and using the generated x-sections to quantify intrusive area as a percentage of the total area between sections. A summation of the individual areas between x-sections was used for quantification of the total percentage of intrusive area within the bulkhead.

This method provided an estimate of rock area irregularity of 45% which exceeds the design minimum of 8.8%. Attached to this report are the x-sections and table generated to quantify that this requirement was met.

**Pumping of concrete, filling of forms and concrete compressive strength**

The same concrete mix that proved successful for the American Tunnel Bulkhead No.1 was used for this bulkhead.

The concrete mix was as follows:

	<u>#/cu. yd.</u>
Portland Type II	720
Coarse Aggregate	1673
Fine Aggregate	1004
Fly Ash, Class F	115
Water	324
Delay Set	

The concrete was batched from the Sandco batch plant in Durango and the Type V cement was added at their portable plant located in Silverton. Delay set was added at the site. The concrete pump was set up downstream of the bulkhead form and concrete was pumped approximately 30' to fill the bulkhead form. The concrete was hauled to the bulkhead from surface in 6 cubic yard Moran cars where it was remixed before discharge into the concrete pump and pumped into the form.

The bulkhead was poured on November 12, 2002 with the first truck arriving around 9:00 a.m. The bulkhead form was determined to be full at approximately 6:00 p.m. on November 12th.

A set of concrete test cylinders was taken for every truck placed in the bulkhead form. The test cylinders were cured on-site. Break tests were performed at 7 days and 28 days to verify that the 3000 psi design strength was met or exceeded. The average 7 day strength obtained from the break tests was 3596 psi and the average 28 day strength obtained from the break tests was 6436 psi, well in excess of the required 3000 psi. All 28 day samples exceeded the 3000 psi compressive strength required by design, therefore no additional testing was planned or done. The test reports are attached.

**Low pressure grouting of the concrete-rock contact**

After construction of the air-side bulkhead form and placement of rebar, the form was marked for drillhole collars by nailing faucet washers to the form at the selected locations. One ring consisting of nine holes was drilled to intersect the rock contact along the perimeter at approximately the mid-point or center of the bulkhead. The target points were selected and then appropriate corresponding collar points were selected such that the hole could physically be drilled without hitting the rebar mat. Angles and distances were measured so the selected lines could be reproduced after the bulkhead form was stripped.

The bulkhead was drilled and the contact was low pressure grouted the week of November 25, 2002.

Each hole was pressured to 200+ psi with very little grout take although one series of holes appeared to take grout into the formation. These holes were re-drilled on successive days and grouted until refusal.

The construction pipe was permanently closed on December 3, 2002 and additional formation grouting was done downstream of the bulkhead for the remainder of the week. Very little grout was accepted during this process.

**Construction Drain Pipe Closure**

The construction drain pipe was permanently grouted closed and capped on December 3, 2002. A grout pig was pumped ahead of the grout to separate the water and grout. The catch bars placed in the up-stream end of the pipe provided a stop for the grout pig allowing complete and total filling of the pipe. The valve was closed under pressure to prevent bleed-off. After curing of the grout in the pipe, the valve was removed and a stainless steel blind flange was bolted to the pipe flange. The pipe has been permanently sealed.

The American Tunnel Bulkhead No.3 construction meets or exceeds all design specifications.

American Tunnel Bulkhead No.3  
Construction Certification Report  
Page 6

Respectfully submitted,

*Larry Roger Perino*

Larry Roger Perino, P.E.  
Colorado Registration #24138

cc: Allen Sorenson

**American Tunnel Bulkhead No.3**  
**Perimeter Area Irregularity**

<b><u>Station</u></b>	<b>P</b>	<b>P<sub>ave</sub></b>	<b>D</b>	<b>P<sub>0</sub></b>	<b>DxP<sub>0</sub></b>	<b>P<sub>ave</sub>xD</b>
0+54.0	38.8					
0+51.0						
		39.9	1.3	19.0	24.7	51.87
0+49.7	41.0					
		41.0	1.7	25.2	42.84	69.7
0+48.0	41.0					
		41.5	2.0	14.6	29.2	83.0
0+46.0	42.0	42.0	6.0	19.0	114.0	252.0
0+40.0	42.0					
TOTALS		-----		11.0	-----	210.74
						-----
						465.57

For the perimeter area between Section 0+40.0 and Section 0+51.0

$$\text{Perimeter Area Irregularity} = 210.74/465.57 = 45\%$$

The perimeter area irregularity of 45% is greater than the 8.8% required to develop the *design strength of the bulkhead*.

JOHN F. ABEL, JR.  
MINING ENGINEER

310 LOOKOUT VIEW COURT  
GOLDEN, CO 80401  
303-279-4901  
FAX 278-8163  
[JFAbel2@attbi.com](mailto:JFAbel2@attbi.com)

November 15, 2002

Mr. Larry Perino  
Sunnyside Gold Corp.  
P.O. Box 177  
Silverton, CO 81433

Dear Larry:

This is the letter report you requested concerning my inspection on November 12, 2002 of the completed preparations for filling the third American Tunnel Bulkhead at approximately Station 3+75. The constructed (as built) bulkhead forms and rebar installed equal or exceed the bulkhead design detailed in my January 15, 2001 letter report. The 13-ft height of the American Tunnel at the bulkhead location is less than the 15-ft design height, apparently the result of decreased overbreak and ballast thickness in the floor. The nominal 12-ft design width of the tunnel is greater than the actual measured maximum 11-ft 9-in tunnel width within the bulkhead forms. The measured 11-ft 2-in bulkhead thickness exceeds the 11-ft design thickness. The as built center to center spacing of the #10 rebar in the downstream cage is 6-in, which is closer than the specified 7-in spacing. Therefore, 2.540 square inches of tensile reinforcement was provided per foot of tunnel width when only 2.177 square inches was specified. All of these differences increase the allowable load carrying capacity of the bulkhead by 34.2% more than the bulkhead design. The rebar cages are 3.5-in from the bulkhead faces as specified in the design report.

I arrived at the bulkhead location at 7:00 a.m. and entered the bulkhead for the inspection at approximately 7:30 a.m. Most of the #10 bars had been tied into the downstream cage at the minimum 3.5 inches from the face of the downstream bulkhead form. Only the final three horizontal bars had not been tied into the downstream cage in order for final access for cleaning and initial filling of the form. The horizontal bars were hanging above the access and inspection opening, ready for installation when the concrete pour reaches that elevation. The three vertical bars that had been spread sideways for access to the form were tied into the cage near the floor. They will be pulled back and tied into the cage as the concrete rises in the form. The downstream #10 tension bars were measured on 6-inch centers and the minimum 3.5-in spacing of the rebar cage from the bulkhead forms, as specified. The #6 shrinkage

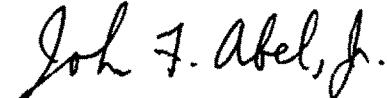
and temperature bars had been tied into the upstream cage at the minimum 3.5-in from the face of the upstream bulkhead form and on 12-in centers, as specified. All the rebars had been individually cut to fit, no splices used in either rebar cage.

Removal of loose rock from the tunnel roof, walls and floors has resulted in a saw-toothed bulkhead. The blocky nature of the latite porphyry results in the irregularities present on the back, ribs and floor extending approximately 1-ft into the tunnel cross section, considerably more than the specified 0.14-in. The shape of the rock adjacent to the bulkhead is excellent for resisting movement under the design hydraulic thrust. As we discussed the fracture permeability in the block latite porphyry at the bulkhead location will probably require low pressure grouting of the concrete/rock contact to prevent leakage during water impoundment. A few gallons of water was present at low spots in the floor of the bulkhead section. The pump for removing the water inside the forms was present inside the forms. It will be used to remove the water on the floor immediately before starting the pour.

One thrust collar and two water stops are installed on the bypass pipe. Trim bars were tied into each rebar cage where the bypass pipe passes through the rebar.

Filling of the form should proceed as soon as possible.

Sincerely,



John F. Abel, Jr.  
Colorado P.E. 5642



MINE ID # OR PROSPECTING ID # M-1977-378  
 INSPECTION DATE 8/17/01

INSPECTOR'S INITIALS WHE

### OBSERVATIONS

This inspection occurred to verify preparations of the tunnel and bulkhead forms for bulkhead #3 in the American Tunnel, prior to concrete pour. Bulkhead #1 in the American Tunnel was approved under TR-14. Bulkheads #2 and #3 were approved under TR-25. The accelerated construction schedule for bulkheads #2 and #3 were addressed in the third amendment to the Consent Decree, Case No. 94 CV 5459. Final closure of bulkhead #1 was completed during 1996. In 1999, DMG determined that the mine pool, impounded behind bulkhead #1, had reached physical equilibrium. On 9/13/02, DMG approved the construction certification report and performance report for bulkhead #2 and approved permanent closure of bulkhead #2.

The Sunnyside Mine is approved for 236.21 acres affected area. DMG holds \$1,250,000 financial warranty. Operator has commenced final reclamation. Water treatment plant at the American Tunnel facility was active.

Location of bulkhead 3 was approximately 375 foot in from the portal, immediately upstream of a fracture zone which was well supported with heavy timbers. Preparations for concrete pour for bulkhead 3 were near completion and appeared to meet or exceed the minimum requirements of the designs approved under TR-25. The downstream face of the concrete form was constructed from 8" x 8" timbers, 2" x 12" lumber and  $\frac{3}{4}$ " plywood, backed with heavy angle iron and well braced to rock bolts in the tunnel walls, floor and ceiling. Upstream and downstream forms fitted intimately with irregularities in the tunnel surface. Tunnel walls, floor and ceiling at the bulkhead location had been cleaned of loose rock. All portions of the cleaned tunnel appeared to be competent rock with sufficient surface irregularity for concrete contact. Portions of the tunnel irregularity exceeded 1.5' (feet), a significant improvement over the 0.14" (inch) minimum irregularity required in the approved design. Downstream rebar mat consisted of #10 rebar on 6" centers (vertical and horizontal). The 6" spacing of the downstream rebar mat is an improvement over the minimum 7" spacing calculated by the design engineer. Such improvement should increase the factor of safety provided in the approved design for stress and earthquake loading. The downstream rebar mat was spaced 4.5" from the face of the form, an improvement over the minimum 3.5" concrete cover required in the approved designs. Upstream rebar mat consisted of #6 rebar on 12" centers, with 3.75" spacing from the face of the concrete form. Drain pipe, 6" diameter stainless steel with one 3/8" thick thrust ring and two seep rings, conveyed mine drainage through the bulkhead form. The thrust ring was welded to the drain pipe approximately 22.5" from the upstream form face. The operator installed 6" pipe rather than the 4" pipe anticipated in the design, to ensure adequate drain capacity during bulkhead construction. Trim bars were installed at approximate 45 degrees to the rebar mat, around the drain pipe to prevent corner cracking. Final bulkhead will be at least 11' long, 12' wide and 15' high.

The operator indicated that a coffer dam had been constructed immediately upstream of the bulkhead location. The coffer dam was necessary to impound water to sufficient height to enter the drain pipe and route mine drainage through the bulkhead during construction. The operator also indicated that approximately 3 tons of hydrated lime had been placed between bulkheads 2 and 3 to buffer the pH of the water impounded behind bulkhead 3, in accordance with the approved designs.

#### I & E Contact Address

NAME Larry Perino  
 OPERATOR Sunnyside Gold Corporation  
 STREET P.O. Box 177  
 CITY/STATE/ZIP Silverton, CO 81433

cc: Harry Posey, DMG

- CE
- BL
- FS
- HW
- WQCD, Andrew M. Ross
- OTHER

# Sundale Associates, Inc.

ENGINEERING AND TESTING

## CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

LAB NO. 4362 JOB NO. 02116 SAMPLED BY: \_\_\_\_\_ DATE: 11/14/02

CLIENT: Sunny Gold Corporation

PROJECT: American Tunnel No. 3 Bulkhead

POUR LOCATION: 7 Day Breaks

BATCH INFORMATION: SOURCE: Sunny Gold Corporation TICKET NO: \_\_\_\_\_

DESIGN ID: \_\_\_\_\_ BATCH TIME: \_\_\_\_\_ POUR TIME: \_\_\_\_\_

1-1/2"        LB 3/4"        LB 3/8"        LB SAND        LB

CEMENT        LB FLYASH        LB WATER        GAL + GALLONS ADDED       

AEA        OZ WRA        OZ OTHER       

SPECIFIED STRENGTH AT 28 DAYS:        PSI. SET 1 OF 1

### FIELD TESTING DATA:

AIR:        SLUMP:        IN. TEMPERATURE: GROUT        AMBIENT       

UNIT WEIGHT:        LBS/CU FT. NO. OF CYLINDERS AND SIZE: 5- 4" \* 8"

CURING: X FIELD CURE 24 HOURS AND SUBSEQUENT MOIST CURE

       FIELD CURE

### SUPPLEMENTAL FIELD TESTS:

TRUCK NO. TICKET NO. AIR(%) SLUMP ("') CONC. TEMP AIR TEMP H2O ADDED

TRUCK NO.	TICKET NO.	AIR(%)	SLUMP ("')	CONC. TEMP	AIR TEMP	H2O	ADDED

REMARKS: \_\_\_\_\_

### COMPRESSIVE STRENGTH DATA: ALL BREAKS ARE LAB CURED UNLESS OTHERWISE NOTED

DATE POURED: 11/14/02

DATES TESTED: 11/21/02

TEST NO.	1	1 - A	44000	#	3500	PSI		#		PSI
	1	2 - A	32500	#	2590	PSI		#		PSI
	1	3 - A	29000	#	2310	PSI		#		PSI
	1	4 - A	60500	#	4810	PSI		#		PSI
	1	5 - A	60000	#	4770	PSI		#		PSI
				#		PSI		#		PSI

ORIGINAL SENT TO: Sunny Gold Corporation

COPIES SENT TO: \_\_\_\_\_

COPIES SENT TO: \_\_\_\_\_

SUNDALE ASSOCIATES, INC.

BY: \_\_\_\_\_

WAYNE M. DALE, P.E.  
COLORADO REGISTRATION NO. 18688

# Sundale Associates, Inc.

ENGINEERING AND TESTING

## CONCRETE CYLINDER COMPRESSIVE STRENGTH TEST REPORT

LAB NO. 4368 JOB NO. 02116 SAMPLED BY: \_\_\_\_\_ DATE: 11/14/02

CLIENT: Sunny Gold Corporation

PROJECT: American Tunnel #3 Bulkhead

POUR LOCATION: 28 Day Breaks

BATCH INFORMATION: SOURCE: Sunny Gold Corporation TICKET NO: \_\_\_\_\_

DESIGN ID: \_\_\_\_\_ BATCH TIME: \_\_\_\_\_ POUR TIME: \_\_\_\_\_

1-1/2" LB 3/4" LB 3/8" LB SAND LB

CEMENT LB FLYASH LB WATER GAL + GALLONS ADDED \_\_\_\_\_

AEA OZ WRA OZ OTHER \_\_\_\_\_

SPECIFIED STRENGTH AT 28 DAYS: \_\_\_\_\_ PSI. SET 1 OF 1

### FIELD TESTING DATA:

AIR: \_\_\_\_\_ SLUMP: \_\_\_\_\_ IN. TEMPERATURE: GROUT AMBIENT \_\_\_\_\_

UNIT WEIGHT: \_\_\_\_\_ LBS/CU FT. NO. OF CYLINDERS AND SIZE: 5- 4" \* 8"

CURING: X FIELD CURE 24 HOURS AND SUBSEQUENT MOIST CURE

\_\_\_\_\_ FIELD CURE

### SUPPLEMENTAL FIELD TESTS:

TRUCK NO.	TICKET NO.	AIR(%)	SLUMP("")	CONC. TEMP	AIR TEMP	H2O	ADDED
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TRUCK NO.	TICKET NO.	AIR(%)	SLUMP("")	CONC. TEMP	AIR TEMP	H2O	ADDED

REMARKS: \_\_\_\_\_

COMPRESSIVE STRENGTH DATA: ALL BREAKS ARE LAB CURED UNLESS OTHERWISE NOTED

DATE POURED: 11/14/02

DATES TESTED: 12/12/02

TEST NO.	1	1 - B	86500	#	6880	PSI	#	PSI
	1	2 - B	76000	#	6050	PSI	#	PSI
	1	3 - B	74000	#	5890	PSI	#	PSI
	1	4 - B	83000	#	6600	PSI	#	PSI
	1	5 - B	85000	#	6760	PSI	#	PSI
				#		PSI	#	PSI

ORIGINAL SENT TO: Sunny Gold Corporation

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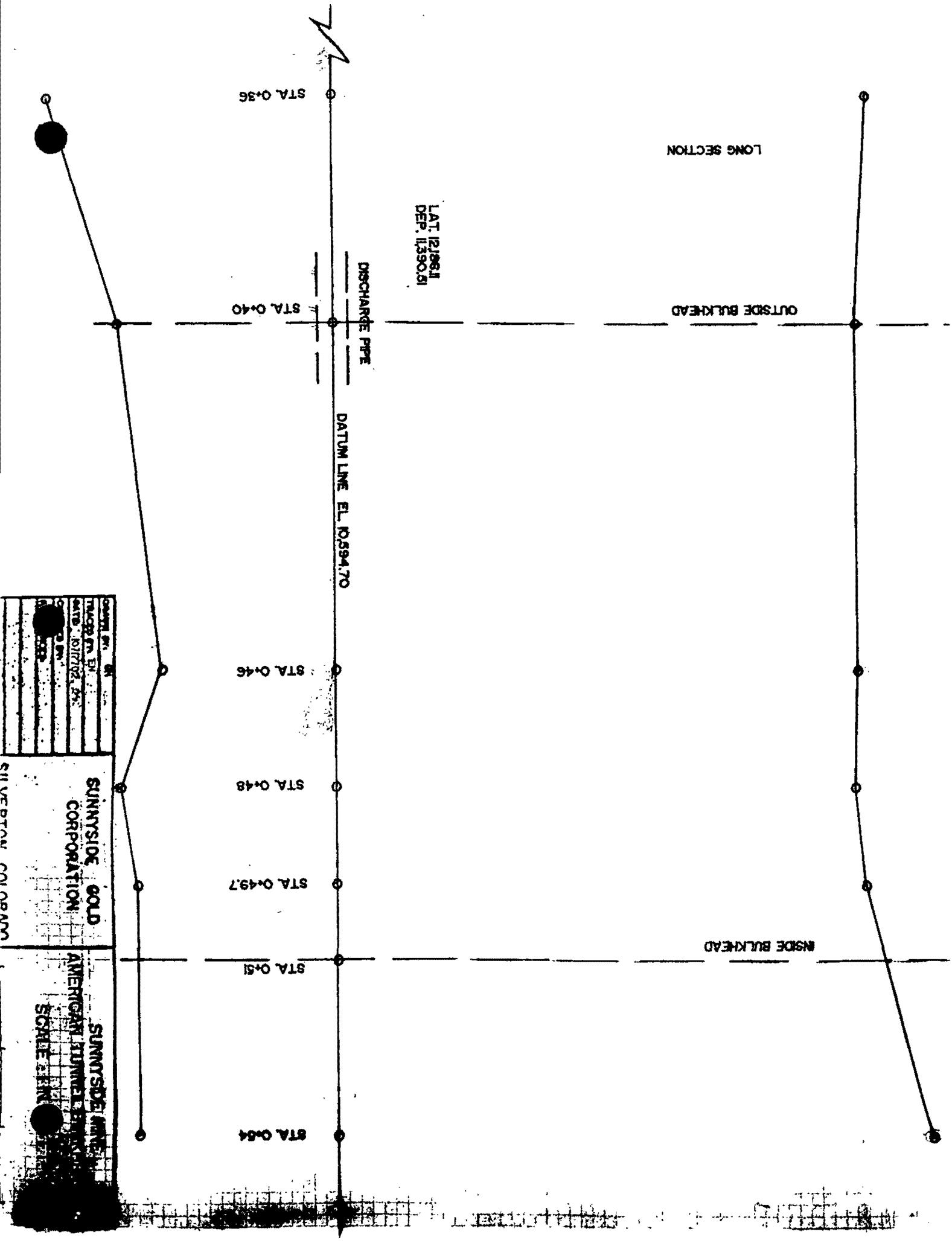
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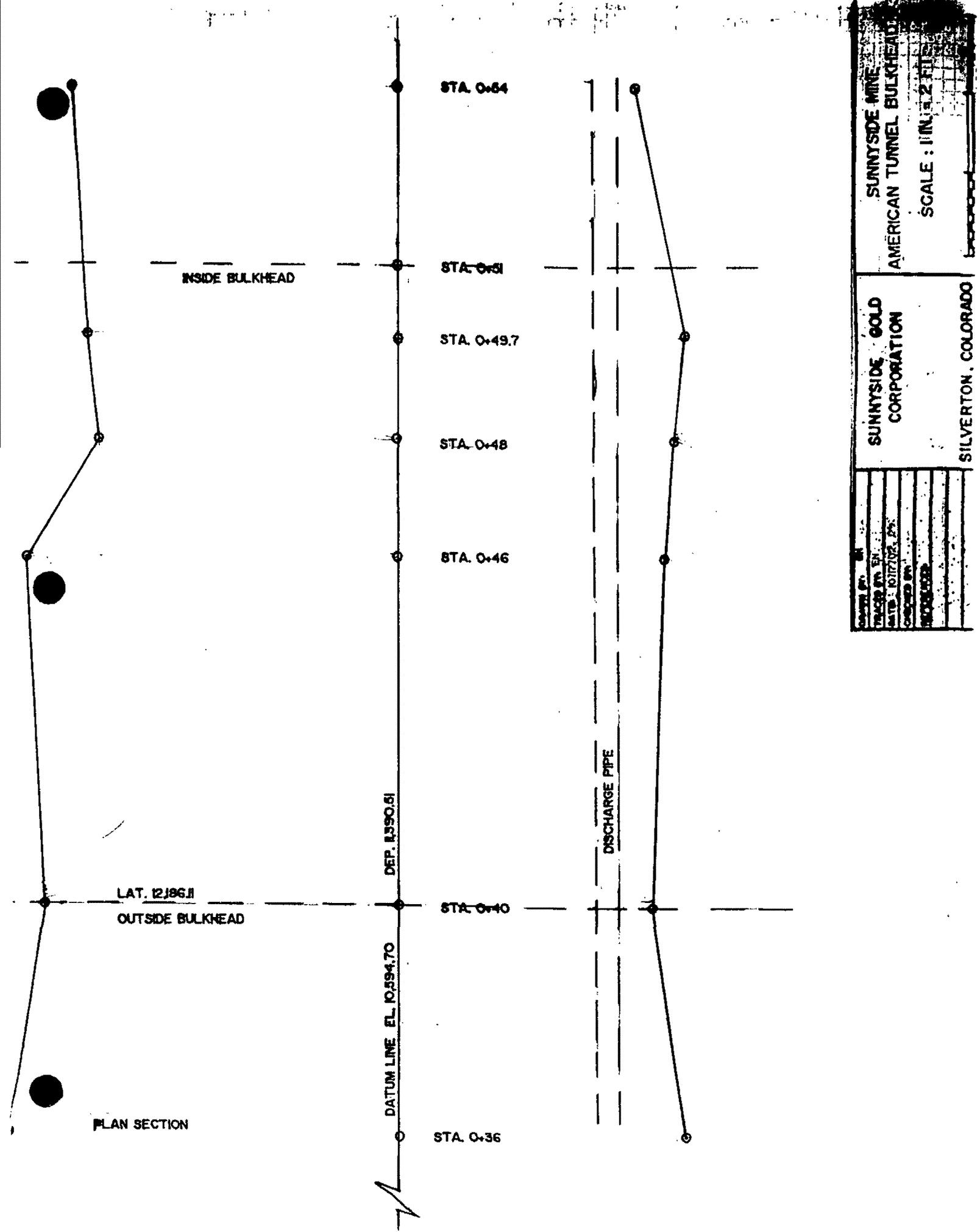
SUNDALE ASSOCIATES, INC.

BY: \_\_\_\_\_

WAYNE M. DALE, P.E.

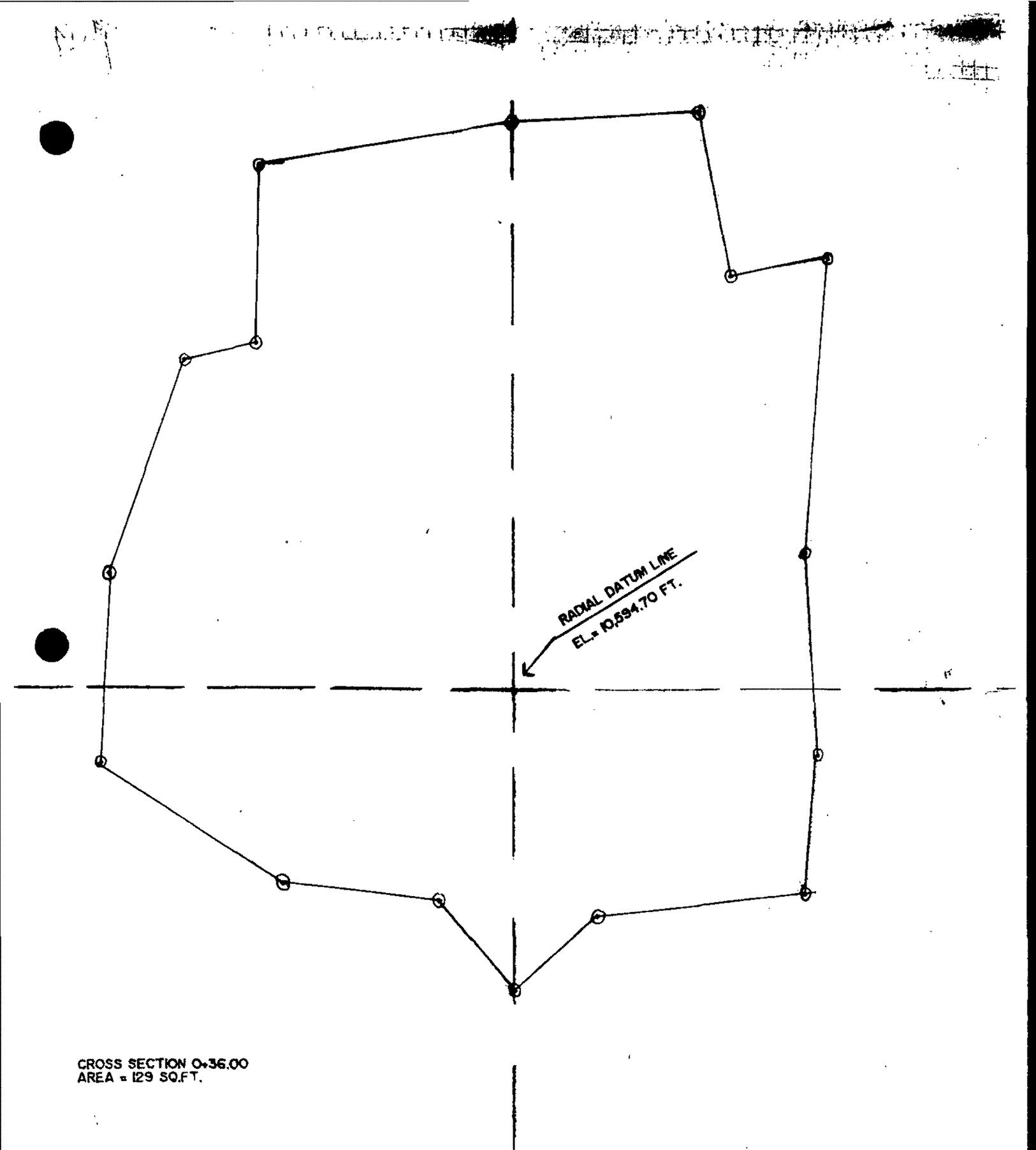
COLORADO REGISTRATION NO. 18688





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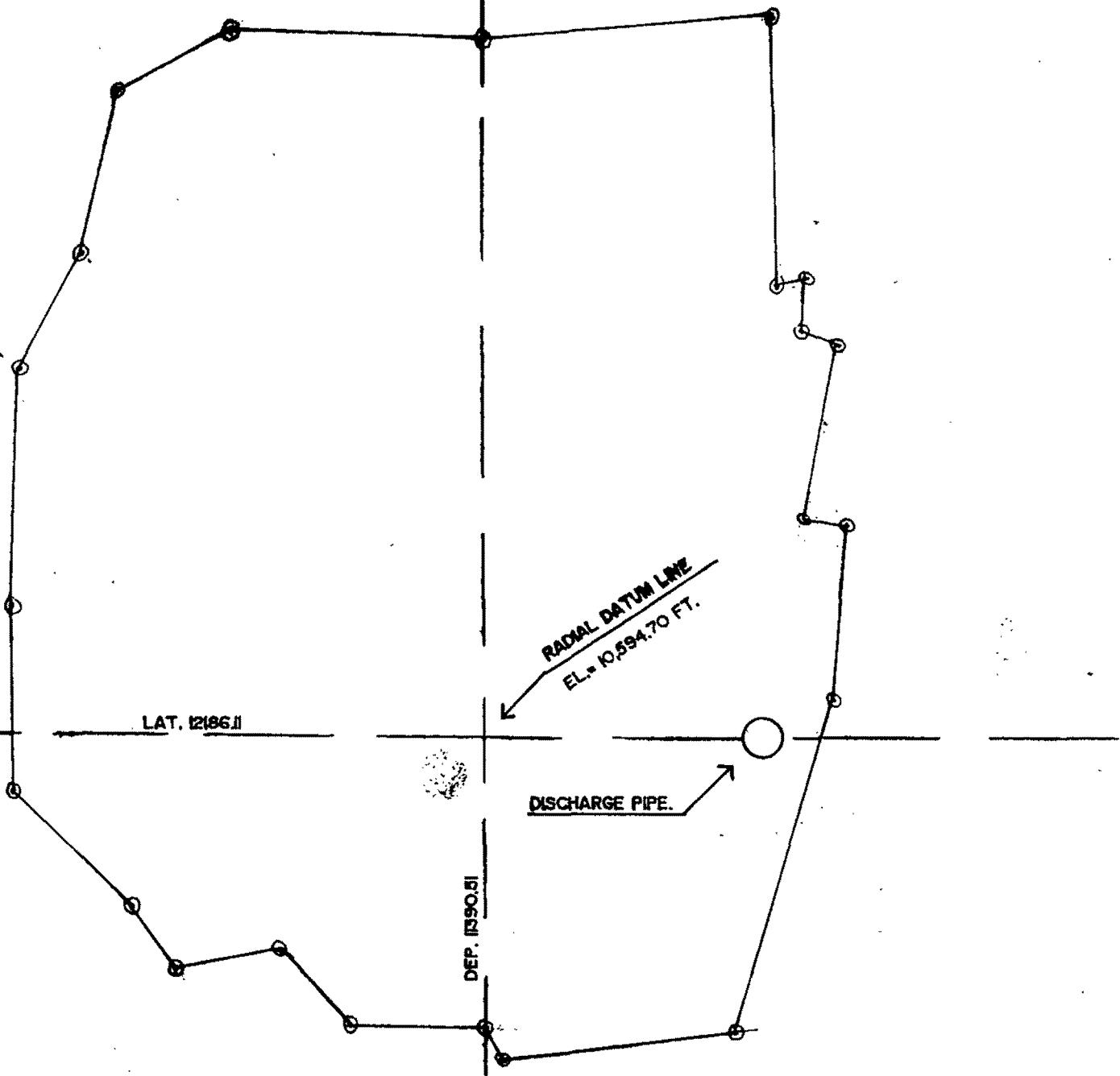
CROSS SECTION 0+36.00  
AREA = 129 SQ.FT.

DRAWN BY:	DR
TRACED BY:	EN
DATED:	10/17/02
CHECKED BY:	
RECORDED BY:	

SUNNYSIDE GOLD  
CORPORATION

SUNNYSIDE MINE  
AMERICAN TUNNEL BULKHEAD #

SCALE : 1 IN. = 2 FT.

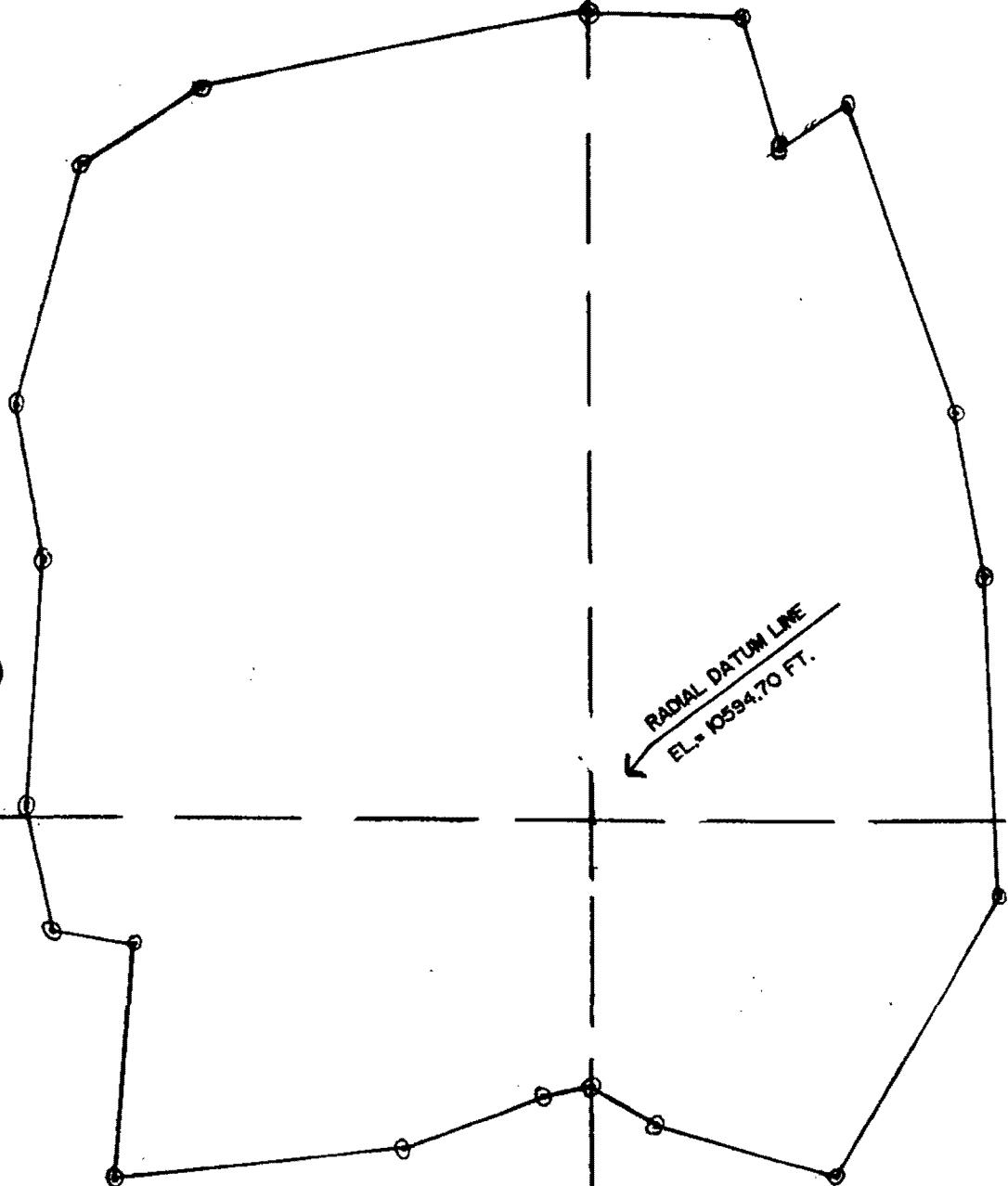


CROSS SECTION 0+40.00  
AREA = 121.6 SQ.FT.

DRAWN BY: GR
TRACED BY: EN
DATED: 10/17/02, 2pm
CHECKED BY:
RECORDED BY:

SUNNYSIDE GOLD  
CORPORATION

SUNNYSIDE MINE  
AMERICAN TUNNEL BULKHEAD #3  
SCALE: 1 IN. = 2 FT.



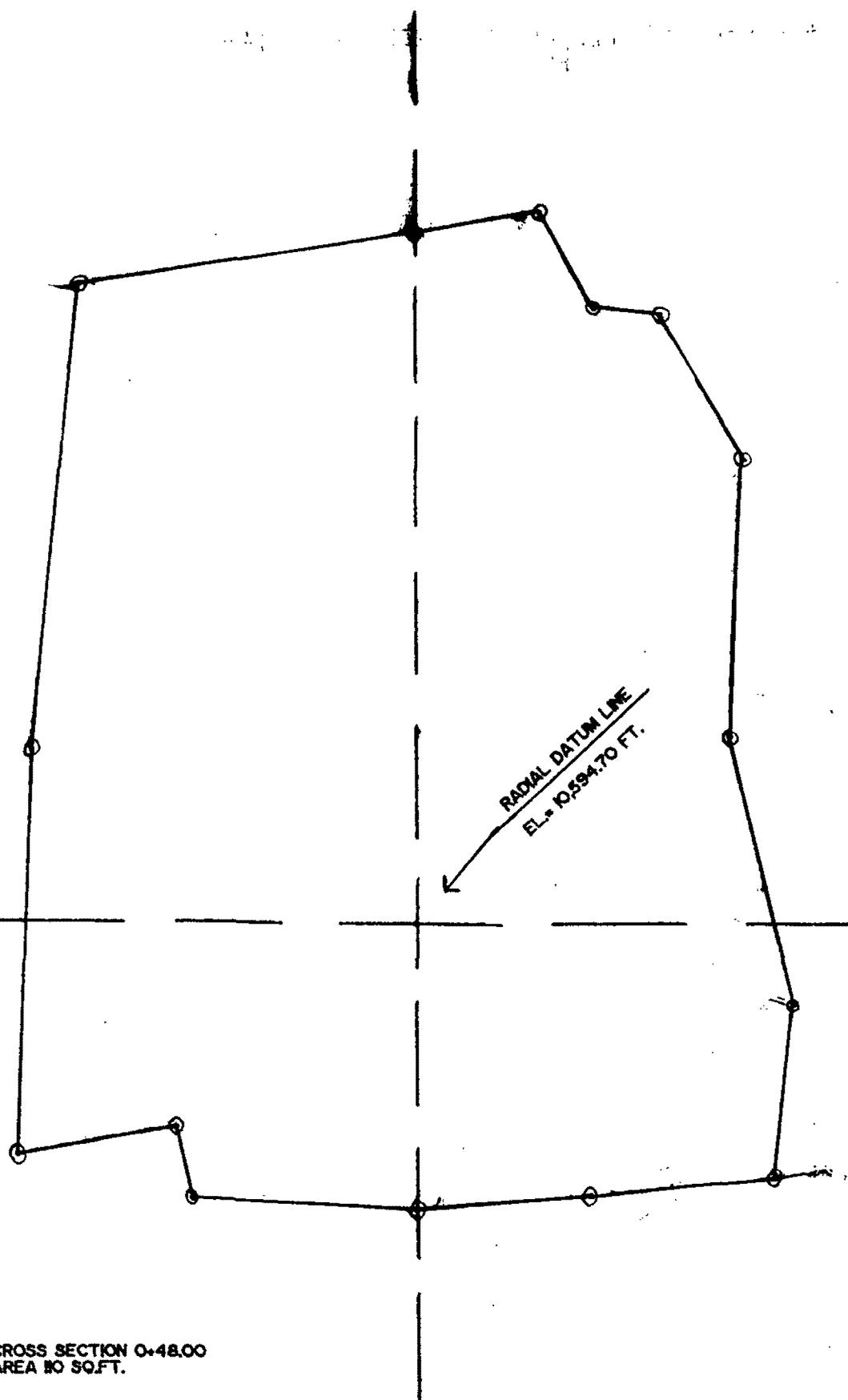
CROSS SECTION 0.46.00  
AREA 120 SQ.FT.

DRAWN BY: DR	
TRACED FROM EN	
DATED: 10/17/02. 2-1	
CHECKED BY:	
RECORDED BY:	
SUPERVISOR:	
REMOVED BY:	

SUNNYSIDE GOLD  
CORPORATION

SUNNYSIDE MINE  
AMERICAN TUNNEL BULKHEAD #  
SCALE: 1 IN. = 2 FT.

CROSS SECTION 0+48.00  
AREA 80 SQ.FT.



DRAWN BY:	EN:
TRACED BY:	DATE:
SUPERVISED BY:	10/17/92
APPROVED BY:	
RELEASER:	

SUNNYSIDE GOLD  
CORPORATION

SUNNYSIDE MINE:  
AMERICAN TUNNEL BULKHEAD #3  
SCALE : 1 IN. = 2 FT.

CROSS SECTION 0+49.70  
AREA 16 SQ.FT.

DRILLED BY: EN	TRACED BY: EN	SUNNYSIDE GOLD CORPORATION	SUNNYSIDE MINE AMERICAN TUNNEL BULKHEAD #
DATE: 10/17/02, 24	RECORDED BY:		SCALE: 1 IN. = 2 FT.
CHECKED BY:			
RECORDED BY:			

CROSS SECTION O-54.00  
AREA 15 SQ.FT.

DRILLED BY:	DR.
TRACED BY:	EN.
DATE:	10/17/02, 29.
CHALKED BY:	
RECORDED BY:	

SUNNYSIDE GOLD  
CORPORATION

SUNNYSIDE MINE  
AMERICAN TUNNEL BULKHEAD #3  
SCALE : 1 IN. = 2 FT.